

# Data Replication over Disadvantaged Links

## A Canadian Naval Perspective

*By Commander John Bycroft*

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# The Maritime Imperative

National, Joint or Coalition  
Maritime Operational  
*Efficiency, Effectiveness and  
Timeliness*

# The Solution

Network-Centric Information Management  
requiring:

- ◆ Access to the shore Information Management Infrastructure;
- ◆ A web-enabled user community; and
- ◆ Seamless communication links.

# The Problems

- ◆ Extremely small ‘footprints’
- ◆ Highly unstable platforms
- ◆ Non-continuous Connectivity
- ◆ Small antennas/limited power
- ◆ Mutual interference
- ◆ Disparate systems

= Disadvantaged Users

# The Compromise

*Collaboration at Sea*  
(C@S)

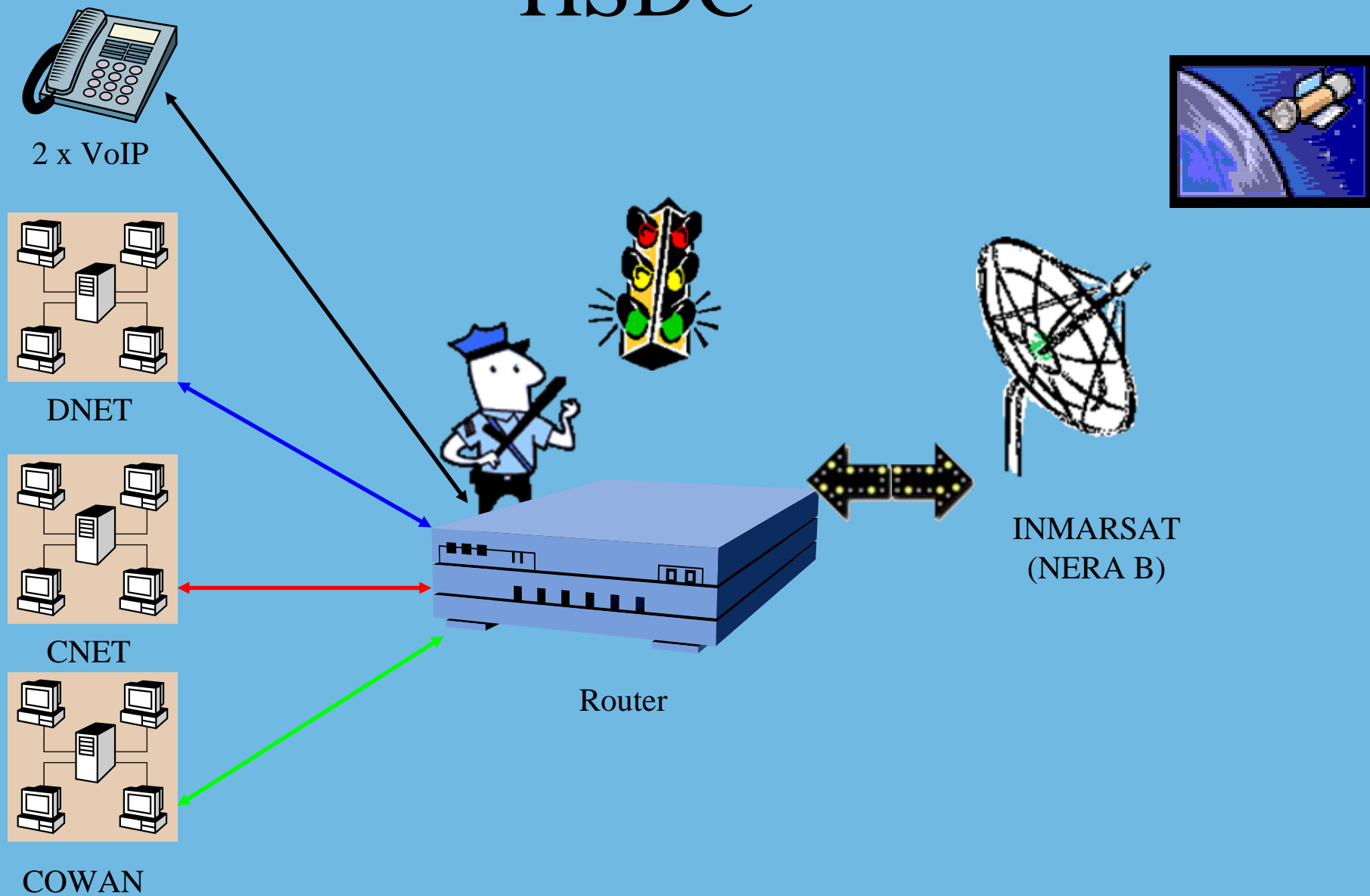
# C@S Elements

- ◆ High Speed Data Connectivity (HSDC) Project - technical architecture
- ◆ Connectivity through INMARSAT/SHF SATCOM – Ship/Shore/Ship Pipe
- ◆ IBM/Lotus Software – enabling technology

# C@S Elements - HSDC

- ◆ Routers provide access to three separate domains:
  - DNET (Unclass/Protected, including Enterprise applications)
  - CNET (Classified)
  - COWAN (Coalition) (Tactical WAN)
- ◆ Voice over IP (VoIP) telephones
- ◆ Combined Operational Picture (COP)
- ◆ COMSEC encryption (TACLANE/KG-175)
- ◆ Link (TRANSEC) encryption (KIV-7)

# HSDC



# C@S Connectivity

- ◆ 24/7 Connectivity through commercial provider (INMARSAT)
- ◆ Leased channels
- ◆ 64 kbps ISDN – concurrent 64k up and down
- ◆ 128 kbps with binding (2x64 channels)
- ◆ Packet switching through CISCO routers
- ◆ Reliability (23:40 hours per day = >99%)

# C@S Elements – Software

- ◆ Domino Network
  - Standardized Task Group Website
    - Standardized Web Site Design
    - Distributed Web Environment
    - Web Site Data Replication
  - Lotus Sametime
    - Chat and Whiteboard

# Collaboration At Sea

Using Information and Web  
Technology  
for  
Tactical Command and Control

# Task Group Website

- ◆ Principal means to share data & information
  - Not only a flagship or flag-staff tool
  - Used by all TG units and involved shore commands
  - Common source of information
- ◆ Easy to access/intuitive to use
- ◆ Timely

# Secret of Success

## Frequent Data Replication

# Constraints on Replication

- ◆ Need for an initial ‘Large dump’
- ◆ Need for reliable communications (QoS)
- ◆ Need for standardized TEMPLATES
- ◆ Need for learning (some) web techniques.

# Advantages of Replication

- ◆ Significant bandwidth saving
- ◆ Continuous operation
- ◆ Provides a common locally accessible data-base.
- ◆ Ability for units to continue operations during EMCON silence

# Domino REPLICATION

- ◆ Monitors data transfer during replication
  - Will restart interrupted replication at point of interruption automatically
- ◆ Website made up of multiple databases – replication can be selective within the Website
- ◆ Replication can be “server” specific vice “network”


# Standardized BG Web Site

http://205.0.128.115/Battle\_Groups/Constellation/consite.nsf - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Size Print Edit

Address http://205.0.128.115/Battle\_Groups/Constellation/consite.nsf Go Links >>



**Operational**

[ADC](#)  
[Flag Plans](#)

[SCC](#)  
[Force Protection](#)

[ACC](#)  
[FOTC](#)

[IWC](#)  
[TLAM](#)

[ROE](#)

**Administrative**

[N1](#)  
[PAO](#)

[N2](#)

[N3](#)  
[IM](#)

[N4](#)

[N6](#)

[JAG](#)

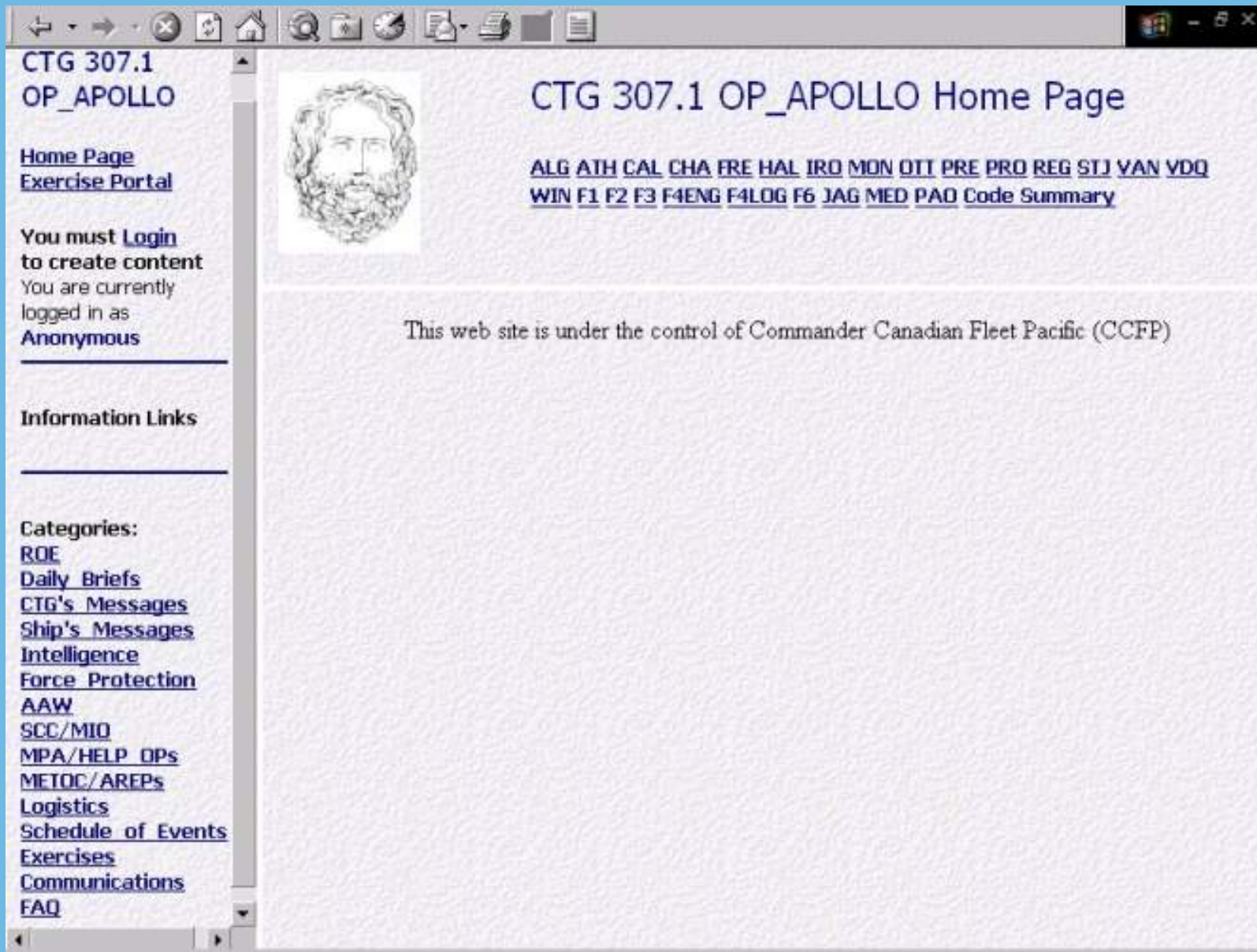
Replication Testing Ongoing  
**USS Constellation BattleGroup**

<p><a href="#">BUSINESS RULES</a></p> <p><a href="#">ADMIRAL's BRIEF</a></p> <p><a href="#">INTEL READ BOARD</a></p> <p><a href="#">OPREP/OPSUM/UNIT SITREP</a></p> <p><a href="#">METOC</a></p> <hr/> <p><a href="#">CCDG-1</a></p> <p><a href="#">CDS-7</a></p> <p><a href="#">CWW-2</a></p> <p>▶ <a href="#">SHIPS</a></p> <p>▶ <a href="#">SQUADRONS</a></p> <hr/> <p><a href="#">STAFF RESOURCES</a></p> <p><a href="#">LINKS</a></p> <p><a href="#">CHAT</a></p> <p><a href="#">SIPRNET SEARCH</a></p> <p><a href="#">CON YELLOW PAGES</a></p> <p><a href="#">FLEET WEB SUPPORT</a></p> <hr/> <p><a href="#">EDITOR LOGIN</a></p> <hr/> <p><a href="#">USER REGISTRATION</a></p>	<p><a href="#">Commander's Guidance</a></p> <p><a href="#">ROE</a></p> <p><a href="#">Intel</a></p> <p><a href="#">Exercises</a></p> <p><a href="#">Operations</a></p> <p><a href="#">EMPSKED</a></p> <p><a href="#">SOE</a></p>	<p><a href="#">Daily Intentions</a></p> <p><a href="#">DIP Clearances</a></p> <p><a href="#">Plans/Readiness/Training</a></p> <p><a href="#">Logistics</a></p> <p><a href="#">COMMS/LINKS</a></p> <p><a href="#">OPTASKS</a></p>
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[DOD WARNING](#)

Internet

# CTG 307.1 Web Site



# Collaboration At Sea

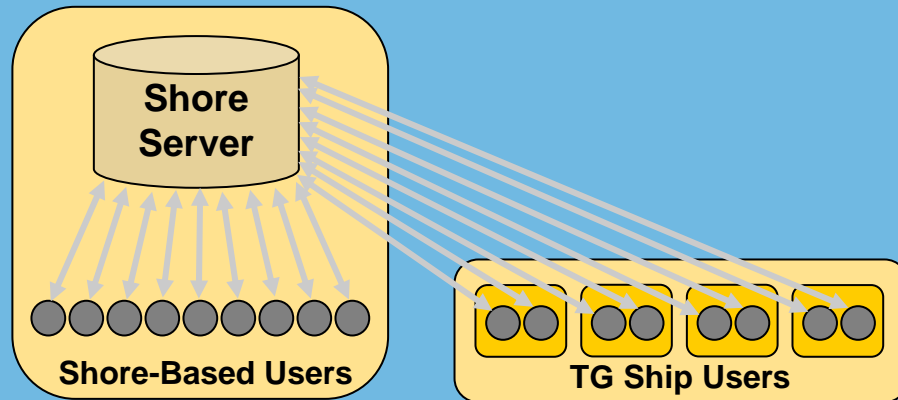
Distributive Web Environment



# Traditional Non-Replicated Web Environment

- ♦ **Web site and content managed by centralized (Shore) personnel**
- ♦ **Numerous inefficiencies**
- ♦ **Web pages downloaded with each user visit**
- ♦ **INMARSAT outages degrade site availability**

# Non-Replicated TG Web Site



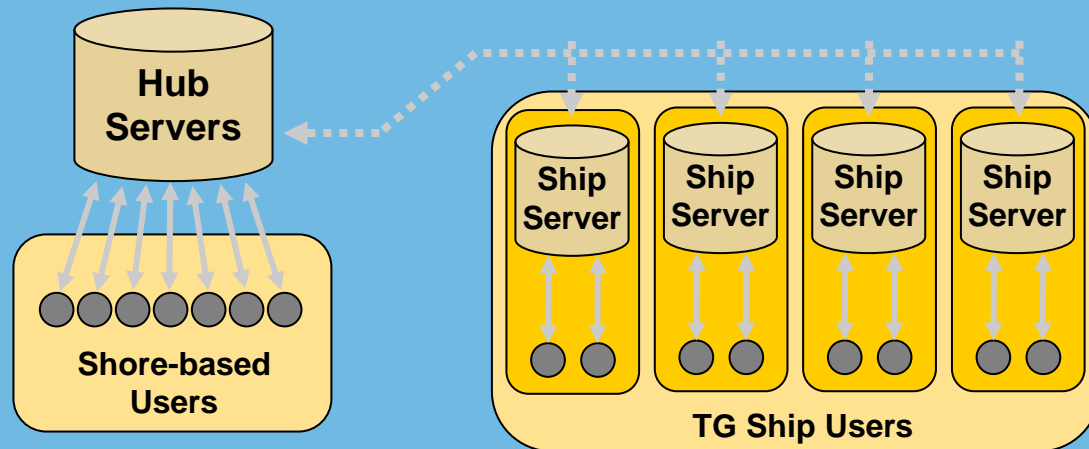
## Original Configuration

- Excessive bandwidth needs
- Centralized data posting (bottleneck)
- Connectivity failure = Site data inaccessible

# C@S Distributive Web Environment

- ◆ **Web Site centrally controlled by TG Commander**
- ◆ **Standardized**
- ◆ **Sites reside on each ship**
- ◆ **Users visit site via ship's LAN**
- ◆ **Changes to data/info are downloaded to each unit only once:**
  - **Clustered, cyclic, or on demand**
  - **Overall bandwidth demand significantly reduced (huge benefits for the “bandwidth-challenged”)**

# C@S TG Web Network



## Collaboration at Sea Web Environment

- Replicated (“mirrored”) web sites
- Decreased bandwidth needs (only changes in information are replicated)
- Dispersed content management responsibility
- Connectivity failure = Web site data remains accessible

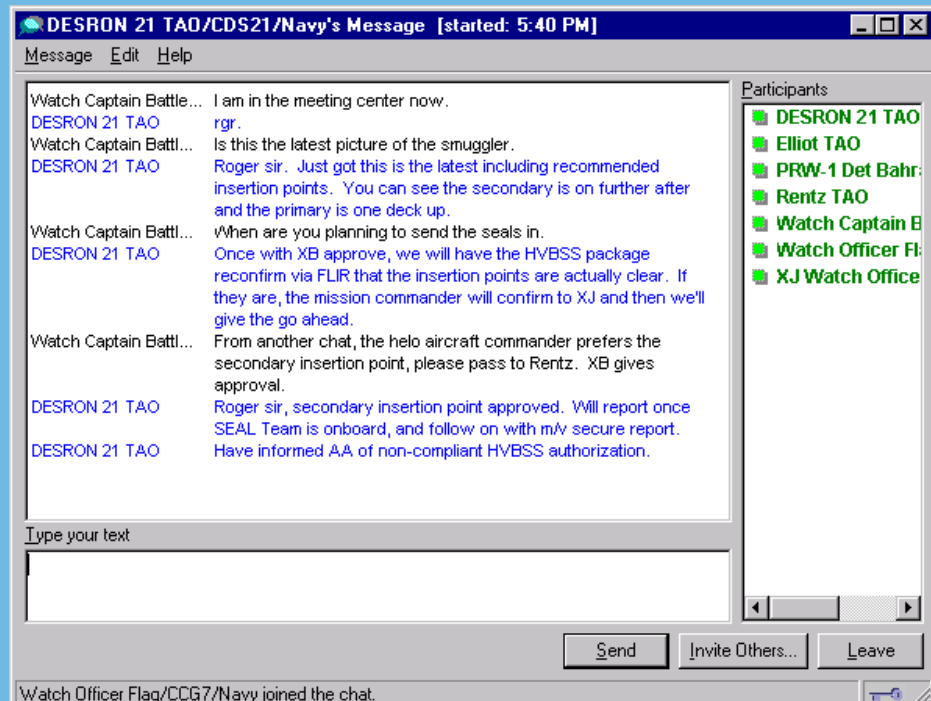
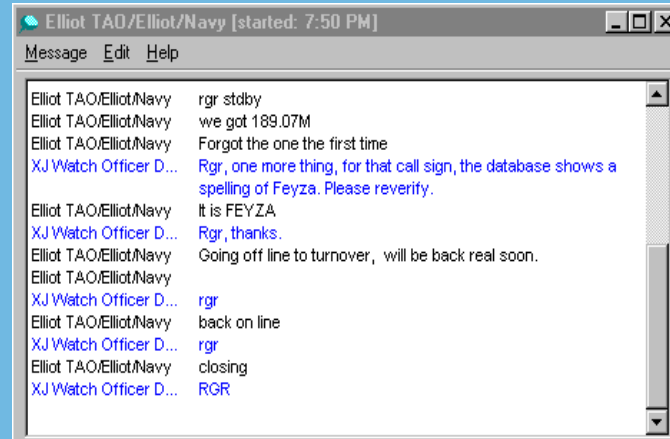
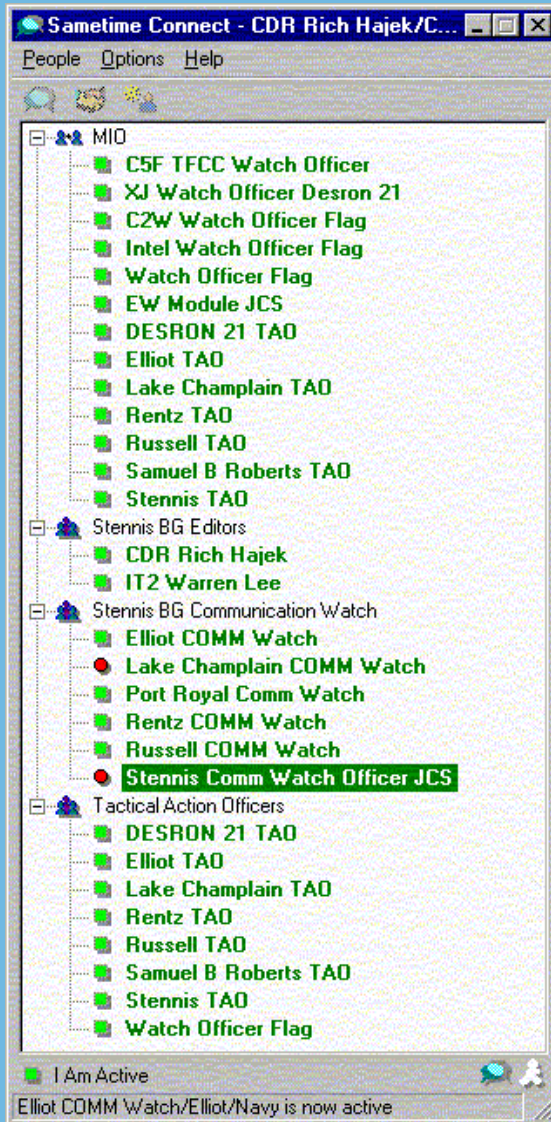
# Lotus Sametime

**A Robust Tool for Real-Time Distributive  
Collaborative Planning**

## **Provides:**

- ◆ **One-on-one or group chat**
- ◆ **Multi-user whiteboard collaboration**
- ◆ **Live application sharing**

# Real-Time Chat



# Real-Time Collaboration: MIO

**N Sametime Online Meeting Room: SPI demo**

Whiteboard Application Sharing Participant List

Whiteboard Page 1 Fit to Window



**DESRON 21 TAO/CDS21/Navy's Message [started: 5:40 PM]**

Message Edit Help

Watch Captain Battle... I am in the meeting center now.  
DESRON 21 TAO rgr.  
Watch Captain Battle... Is this the latest picture of the smuggler.  
DESRON 21 TAO Roger sir. Just got this is the latest including recommended insertion points. You can see the secondary is on further after and the primary is one deck up.  
Watch Captain Battle... When are you planning to send the seals in.  
DESRON 21 TAO Once with XB approve, we will have the HVBSS package reconfirm via FLIR that the insertion points are actually clear. If they are, the mission commander will confirm to XJ and then we'll give the go ahead.  
Watch Captain Battle... From another chat, the helo aircraft commander prefers the secondary insertion point, please pass to Rentz. XB gives approval.  
DESRON 21 TAO Roger sir, secondary insertion point approved. Will report once SEAL Team is onboard, and follow on with m/v secure report.  
DESRON 21 TAO Have informed AA of non-compliant HVBSS authorization.

**Participants**

- DESRON 21 TAO
- Elliot TAO
- PRW-1 Det Bahr
- Rentz TAO
- Russell TAO
- Watch Captain B
- Watch Officer Fl
- XJ Watch Office

Type your text

Send Invite Others... Leave

Russell TAO/Russell/Navy joined the chat.

Ready.

Signed by: Lotus Development Corporation

# Real-Time Collaboration: Strike

## ◆ Challenge

- Use of Satellite imagery to evaluate “targets”
- Involving Hawaii, Washington, Ottawa
- Typical >48 hr turn around

## ◆ Solution

- SAMETIME with whiteboard and text/video chat to enable “real time” collaboration
- Turn around <4 hrs



# Real-Time Collaboration: Engineering

Sametime Meeting Room - Diesel Problems - Microsoft Internet Explorer

Meeting Edit View Tools Help

Screen Sharing Whiteboard

damageClaimsEngine1.jpg  
Page 1

Width 3 Line Fill



OTT ENG OK, we pulled the covers and it looks like we have a major problem  
OTT ENG I just circled the problem...can you make it out?  
FMF(CB) Diesel Yes. It looks like the 3rd piston!  
OTT ENG Can you suggest a way ahead?  
FMF(CB) Diesel Sure thing...let me get Tom over here to take a look...

Chat

Ready.

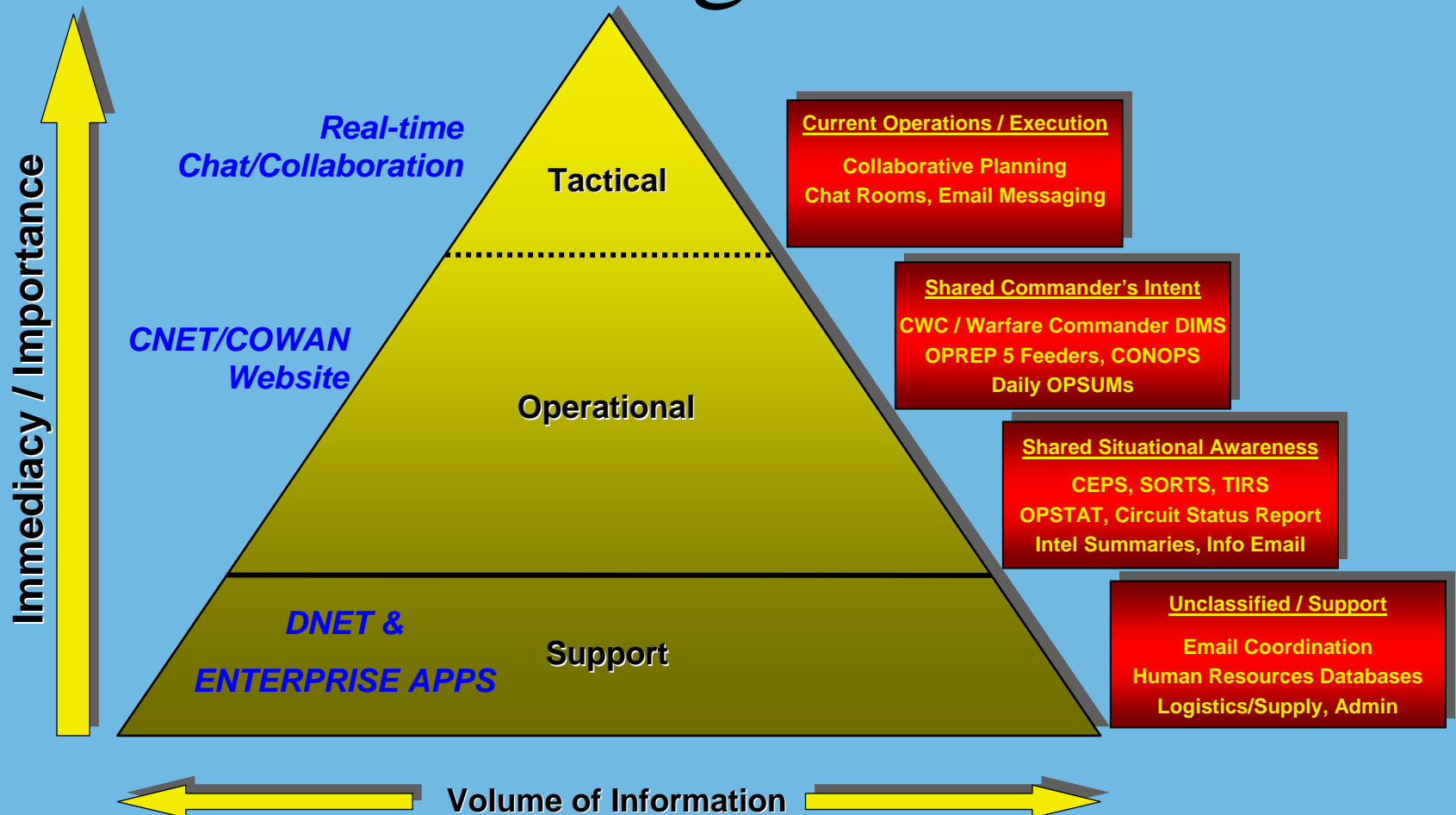
You have all permissions.

0 2 Participants 00:25:27

Start Ser... Inb... Visu... Link... rec... FW... MC... Dies... Sa...

11:01 AM

# Implications for the Warfighter



# Collaboration at Sea...

- ♦ **Is an evolutionary step towards NCW**
- ♦ **Promotes an IT to KM transition**
- ♦ **Is a distributed web environment**
- ♦ **Demonstrates that replication can provide bandwidth conservation & savings**
- ♦ **Demonstrates that replication can benefit disadvantaged users**
- ♦ **Shows that chat can speed decision-making**

But, one must never forget the  
aim.....

Eric Smith

ADMIRAL, WITH ALL  
DUE RESPECT—  
COULD WE HAVE LESS  
NETWORK-CENTRIC  
AND MORE ROUNDS  
ON TARGET?!

